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# CONNECTICUT AGRICULTURAL EXPERIMENT STATION

NEW HAVEN, CONN.

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## Cotton Seed Meal as a Fertilizer

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# COTTON SEED MEAL AS A FERTILIZER

BY

E. H. JENKINS AND JOHN PHILLIPS STREET.

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Cotton seed meal is used quite generally in this state for feeding purposes, but a much larger amount, not less than five thousand tons, is used every year as a fertilizer for tobacco, for which is paid, in the aggregate, about \$155,000.

The growers of wrapper leaf tobacco generally believe that finer quality of leaf is obtained by applications of cotton seed meal than by the use of fish, tankage, or other animal fertilizers.

## COLOR OF MEAL.

While bright meal is the only kind considered safe for feeding, dark, off-color meal is, as far as known, equally valuable as a fertilizer. Meal may become dark by the spontaneous heating of damp stock, by overheating before pressing, or by long exposure to light. Neither of these should make the nitrogen of the meal less available to crops. Often dark meals run high in nitrogen, but as frequently, perhaps, run low. The color of meal is, therefore, no index of the quantity of nitrogen in it.

## PRICE OF MEAL.

Formerly cotton seed meal was bought at relatively low figures, so that the nitrogen in it cost much less than in the other high-grade nitrogenous matters. Thus, in 1899, it sold freely at an average price of \$22.80 per ton, making the nitrogen in it cost 12.9 cents per pound, which was less than the cost in any other agriculturally available form. Since then the price has quite regularly advanced, as appears in the following statement:

AVERAGE RETAIL COST PER TON OF COTTON SEED MEAL IN CONNECTICUT.  
PERCENTAGE OF NITROGEN AND COST PER POUND OF NITROGEN.

Year.	Ton Price.	Average Percent. of Nitrogen.	Average Cost* of Nitrogen per Pound. Cents.
1899 .....	\$22.80	7.14	12.9
1900 .....	25.20	7.26	14.3
1901 .....	26.08	7.24	15.0
1902 .....	27.64	7.08	16.4
1903 .....	26.96	7.09	15.9
1904 .....	27.71	7.13	16.3
1905 .....	27.50	6.93	16.7
1906 .....	32.25	6.60	21.1
1907† .....	31.05	6.85	19.4

These figures show an advance of more than forty per cent. in the ton price in the last seven years. They also show, in the last three years, a considerable decline in the average quantity of nitrogen. This cannot be fully explained by a single bad season. It is claimed that last year the seed was damaged in the field and in consequence it was not possible to hull the seed as perfectly as in normal seasons, so that the resulting meal contained more hulls and, in consequence, less nitrogen than usual. Certainly some meals contain more hulls than they should, and these are not in coarse particles as in the undecorticated meal, but are very finely ground, in which shape they do not darken the meal so much, and make detection more difficult.

#### GUARANTIES.

The main trouble, however, with cotton seed meal has been the great uncertainty as to its composition and quality, the worthlessness of many of the guaranties and the difficulty of getting satisfaction from certain firms whose meal had far less nitrogen than was claimed.

During the last few months the station has examined more than one hundred and fifty samples of cotton seed meal, representing more than two thousand tons. The prices have ranged from \$28.00 to \$32.75, the average being \$31.05 per ton.

The percentage of nitrogen has ranged from 5.69 to 8.14, the average being 6.85.

\* Allowing \$4.42 per ton for the phosphoric acid and potash.

† To date.

Of the one hundred and thirty samples on which a guaranty was reported, forty-one, or nearly one-third of the whole number, failed to meet the guaranty. Twenty-five out of fifty-one samples of "choice" meal fell below that grade and eight did not even meet the guaranty for "extra prime."

Several dealers within the state have paid rebates to purchasers in cases where the meal failed to meet the guaranty, and certain of the commission houses at the south have promptly made good these shortages. Others, it is understood, decline to allow any rebates in such cases.

#### THE PHOSPHORIC ACID AND POTASH IN MEAL.

Besides nitrogen, cotton seed meal contains relatively small quantities of phosphoric acid and of potash.

The average, highest and lowest percentages of the three ingredients found in decorticated meal by the Massachusetts, New Jersey and Connecticut Stations, are summarized below.

	New Jersey. 144 analyses.	Mass. 130 analyses.	Conn. 75 analyses.
Nitrogen Average .....	7.14	7.16	7.18
Highest .....	7.69	—	8.08
Lowest .....	6.52	—	6.01
Phosphoric Acid Average .....	3.09	2.86	2.94
Highest .....	3.75	—	3.69
Lowest .....	2.00	—	1.70
Potash Average .....	1.82	2.01	1.87
Highest .....	2.09	—	2.22
Lowest .....	1.49	—	0.99

The general average calculated from these 349 analyses is 2.97 per cent. of phosphoric acid and 1.90 per cent. of potash.

The figure for phosphoric acid is 0.18 per cent. lower than we have assumed and for potash the same that we have assumed for some years in calculating the cost per pound of nitrogen in cotton seed meal.

The average percentages of phosphoric acid and potash in cotton seed meal, assumed to be 3.15 and 1.90 respectively, are valued together at \$4.42 per ton. To determine the cost of nitrogen, the above figure is subtracted from the ton price and the remainder, after multiplying by 100 to reduce it to cents, is divided by the number of pounds of nitrogen in a ton of meal.

Thus if a sample of meal contains 6.94 per cent. of nitrogen (which is equivalent to 138.8 pounds in the ton) and costs \$27.50 per ton,  $27.50 - 4.42 = 23.08$ . And  $2,308$  divided by  $138.8 = 16.6$ , which is the cost of nitrogen per pound in cents.

Inspection of the range of percentages of potash and phosphoric acid will show that the error caused by assuming an average percentage of these two ingredients instead of determining them in each sample would not amount in extreme cases to more than half a cent on the calculated cost of nitrogen.

#### LAW REGARDING BRAND AND GUARANTY OF MEAL.

Under the laws of this state cotton seed meal is classed as a commercial feed and not as a fertilizer. The law regarding commercial feeds (General Statutes, § 4592) requires that every lot

"shall have affixed thereto, in a conspicuous place on the outside thereof, a legible and plainly printed statement, certifying the number of net pounds of feeding stuff contained therein, the name, brand, or trade-mark under which the article is sold, the name and address of the manufacturer or importer, and a statement of the percentage it contains of crude fat and of crude protein, allowing one per cent. of nitrogen to equal six and one-fourth per cent. of protein," etc.

The sale of cotton seed meal or other commercial feed which does not comply with the above requirements is illegal and *renders the person who sells the meal in Connecticut* liable to a fine of \$100 for the first offense and \$200 for the second.

The attention of dealers within the state is called to the matter now, that they may have it in mind in contracting at the south for deliveries next fall and winter.

The manufacturers should certainly give correct guaranties and not throw this burden and the possibility of prosecution on the dealer, who has no chance to examine the goods till delivered to him and paid for.

With the best effort on the part of manufacturers, shipments will sometimes contain somewhat less nitrogen than is guaranteed, but when a third of the shipments fall below guaranty it is clear that this can only be explained by gross ignorance, carelessness, or fraud.

## REBATES.

The question is frequently asked when a rebate should be claimed and on what basis it should be figured.

The unavoidable errors of analysis certainly amount to 0.05 per cent. Errors in sampling, where great care is used, may amount to 0.1 or 0.15 per cent.

In our opinion if the per cent. of nitrogen found in a sample is not 0.2 per cent. below the guaranty, no rebate should be claimed, but if it is 0.2 per cent. or more below guaranty, rebate should be paid on the whole percentage below.

A fair way to calculate the rebate is the following:


The amounts of phosphoric acid and potash in a ton of meal calculated at ruling prices are worth about \$4.42. Suppose meal is sold at \$32.00. Deducting \$4.42 leaves \$27.58 for cost of nitrogen alone. If 6.5 per cent. are guaranteed, or 130 pounds per ton, a pound of nitrogen in this meal sells for  $\$27.58 \div 130$ , or 21.22 cents.

If the meal contains only 6.25 per cent. (or 125 pounds per ton) there is a shortage of five pounds which, at 21.22 cents per pound, is \$1.06 per ton, the amount of the rebate. This is a little higher than the rebate allowed under the rules of the Cotton Seed Crushers Association.

Occasionally samples of meal contain exceptionally high percentages of nitrogen. Thus six samples analyzed recently have from 8.08 to 8.14 per cent.

It has been suggested that cotton seed meal of low grade may be "fortified" by mixing with it either sulphate of ammonia, nitrate of soda, or some animal matter to improve its analysis.

The average cost of nitrogen in cotton seed meal is a little less than 20 cents. The cost of nitrogen in nitrate is 17.5 cents and in dried blood nearly as much. The margin of profit in the mixing would be very small at most. Nevertheless a considerable number of the samples analyzed this spring have been tested for ammonia and nitrate with negative results, and microscopic examination has never showed the presence of anything foreign to the cotton seed.



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